

# **AGRICULTURAL METALS II**

## **Curriculum Content Frameworks**

### *Prepared By*

Brian Bell, Brinkley High School  
James Frisby, Fayetteville East High School  
James Thieme, Gosnell High School  
Lynn White, Cabot High School

### *Facilitated By*

Karen Chisholm, Program Manager  
Office of Assessment and Curriculum  
Arkansas Department of Workforce Education

### *Edited By*

Angela Collins, Program Advisor  
Office of Agricultural Science and Technology  
Arkansas Department of Workforce Education

### *Disseminated By*

Office of Assessment and Curriculum  
Career and Technical Education  
Arkansas Department of Workforce Education

# Curriculum Content Framework

## AGRICULTURAL METALS II

**Grade Levels 11,12**  
**Course Code 491080**

**Prerequisites: Agriculture Science and Technology; Agricultural Metals I**

Course Description: This course will cover cold metal, hot metal, sheet metal, reading and implementing blueprints as they relate to metal work, arc welding, gas welding and careers related to metal work. Safety will be emphasized.

### Table of Contents

	Page
Unit 1: Introduction to Agriculture Metals II.....	1
Unit 2: Safety Orientation and Procedures .....	2
Unit 3: Careers and Certification .....	3
Unit 4: Advanced Oxyacetylene Cutting .....	4
Unit 5: Advanced SMAW .....	6
Unit 6: GMAW/MIG .....	8
Unit 7: GTAW/TIG .....	11
Unit 8: Plasma Arc Cutting .....	12

# Unit 1: Introduction to Agriculture Metals II

## 5 Hours

Terminology: GMAW, GTAW, Oxyacetylene, Safety, SMAW

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.1 Define the following terms used in Advanced Agriculture Metals		Foundation	Reading	Comprehends ideas and concepts related to metal work in the agricultural industry [3.1.3]
		Thinking	Creative Thinking	Makes connections between seemingly unrelated ideas [4.1.6]
1.2 Identify examples of metal work that involves advanced welding techniques	1.2.1 Research in agricultural metals to find examples of advanced metal working used in Agriculture	Foundation	Reading	Determines what information is needed [1.3.10]  Uses standard occupational resource materials [1.3.22]
		Personal Management	Career Awareness, Development, and Mobility	Develops skills to locate, evaluate, and interpret information [3.3.4]  Explores opportunities [3.1.5]

## Unit 2: Safety Orientation and Procedures

### 5 Hours

Terminology: Breathing hazards, Electrical safety, Gas hazards, Personal safety, Ventilation

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.1 Define terms		Foundation	Reading	Applies/Understands technical words that pertain to a subject [1.3.6]
2.2 Review safety practices in agricultural metals	2.2.1 View videos on proper lab procedures and first aid methods for accidents.	Foundation	Listening	<p>Listens to follow directions [1.2.6]</p> <p>Responds nonverbally to conversation [1.2.9]</p>
		Interpersonal	Leadership	<p>Encourages/Motivates members of a group or team [2.4.6]</p> <p>Organizes group in planning and performing a specific task [2.4.9]</p>
		Personal Management	Integrity/ Honesty/ Work Ethic	<p>Complies with safety and health rules in a given work environment [3.2.2]</p> <p>Follows established rules, regulations, and policies [3.2.5]</p>

## Unit 3: Careers and Certification

### 5 Hours

Terminology: AWS, Helper, Welder

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.1 Define terms		Foundation	Reading	Applies/Understands technical words that pertain to a subject [1.3.6]
3.2 Identify and explain the different types of certification	3.2.1 Research and report on the types of certification available and training needed for each type	Foundation	Reading	Locates pertinent information in documents such as manuals, graphs, and schedules to perform tasks [1.3.18]
		Personal Management	Responsibility	Exerts a high level of effort and perseverance towards goal attainment [3.4.4]
		Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]
3.3 Identify the different opportunities in welding	3.3.1 Locate a local welder to interview regarding how the welding trade has benefited him or her	Foundation	Reading	Reads and follows instructions to operate technical equipment [1.3.19]
				Uses appropriate materials and techniques as specified [1.3.20]
		Interpersonal	Coaching	Helps others learn new skills [2.1.3]
		Thinking	Knowing How to Learn	Uses available resources to apply new skills [4.3.6]

## Unit 4: Advanced Oxyacetylene Cutting

### 15 Hours

Terminology: Cutting attachment, OFC, Operating pressure, Regulator, Slag

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.1 Define terms		Foundation	Listening	Listens to follow directions [1.2.6]
			Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
		Interpersonal	Teamwork	Recognizes effects of positive/negative attitudes on co-workers [2.6.4]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1]
4.2 Identify tools and equipment used in OFC	4.2.1 Demonstrate ability to identify OFC tools and equipment in the Agriculture Mechanics shop	Foundation	Reading	Analyzes and applies what has been read to specific task [1.3.2]
				Applies/understands technical words that pertain to subject [1.3.6]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.3 List the steps in set-up and operation of the OFC unit	4.3.1 Demonstrate the ability to set-up and properly operate the OFC unit.	Foundation	Reading	Follows written directions [1.3.13]  Interprets drawings to obtain factual information [1.3.17]
		Personal Management	Responsibility	Pays close attention to details [3.4.8]  Sets high standards for self in completion of task [3.4.9]
		Thinking	Seeing Things in the Mind's Eye	Organizes and processes images -- symbols, pictures, graphs, objects, etc. [4.6.2]  Visualizes a finished product [4.6.4]

## Unit 5: Advanced SMAW

### 20 Hours

Terminology: Amperage adjustment, Filler pass, Heat adjustment, Root pass

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
5.1 Define terms		Foundation	Reading	Analyzes and applies what has been read to specific task [1.3.2]  Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Personal Management	Responsibility	Maintains a high level of concentration in completing a task [3.4.7]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1]  Extracts rules or principles from written information [4.5.4]
5.2 Identify and select proper welding rods and their usage	5.2.1 Demonstrate ability to select proper rod for given situation	Foundation	Listening	Comprehends ideas and concepts related to tool fitting [1.2.1]  Listens for content [1.2.3]
		Interpersonal	Coaching	Encourages others to develop personal and professional skills [2.1.2]
		Thinking	Seeing Things in the Mind's Eye	Organizes and processes images -- symbols, pictures, graphs, objects, etc.

<b>CAREER AND TECHNICAL SKILLS</b> What The Student Should Be Able To Do		<b>ACADEMIC AND WORKPLACE SKILLS</b> What The Instruction Should Reinforce		
<b>Knowledge</b>	<b>Application</b>	<b>Skill Group</b>	<b>Skill</b>	<b>Description</b>
5.3 Identify welding positions	5.3.1 Demonstrate ability to identify welding positions	Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
		Personal Management	Responsibility	Pays close attention to detail [3.4.8]
5.4 Identify welding joints	5.4.1 Demonstrate ability to identify welding joints	Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
		Personal Management	Responsibility	Pays close attention to detail [3.4.8]
5.5 Explain the differences between pipe and plate welding	5.5.1 Demonstrate ability to weld pipe and plate in a variety of configurations and situations	Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]

## Unit 6: GMAW/MIG

### 25 Hours

Terminology: Bird nesting, Feed rollers, Flow rate, Metal transfer, Wire feed speed

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.1 Define terms		Foundation	Writing	Presents answers/conclusions in a clear and understandable form [1.6.13]  Summarizes written information [1.6.17]
		Personal Management	Integrity/ Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]  Describes desirable worker characteristics [3.2.3]
		Thinking	Knowing How to Learn	Applies new knowledge and skills to welding [4.3.1]  Processes new information as related to workplace [4.3.5]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.2 Identify parts and equipment used in GMAW	6.2.1 Demonstrate ability to identify parts and equipment used in GMAW.	Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]  Responds to listener feedback [1.5.10]
		Personal Management	Responsibility	Exhibits enthusiasm in approaching and completing tasks [3.4.3]  Pays close attention to details [3.4.8]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]
6.3 Explain GMAW set-up	6.3.1 Demonstrate the ability to set-up GMAW machine	Foundation	Science	Monitors variables in experiment [1.4.18]; records data [1.6.16]
		Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible explanations [4.4.5]
6.4 Explain the different applications for gases		Foundation	Writing	Applies/Uses technical words and concepts [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]  Writes logical and understandable sentences [1.6.23]
		Personal Management	Organizational Effectiveness	Presents personal skills as benefits for company objective [3.3.7]
		Thinking	Creative Thinking	Develops visual aids to create audience interest [4.1.4]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.5 Explain proper use of the GMAW machine (proper techniques and applications)	6.5.1 Demonstrate the ability to weld with the GMAW machine in a variety of situations	Foundation	Speaking	Adapts presentation to audience [1.5.1]  Applies/uses technical terms as appropriate to audience [1.5.2]  Organizes ideas and communicates oral messages to listeners [1.5.7]
		Thinking	Decision Making	Demonstrates decision-making skills [4.2.4]  Evaluates information/data to make best decision [4.2.5]
			Reasoning	Uses logic to draw conclusions from available information [4.5.6]

## Unit 7: GTAW/TIG

### 10 Hours

Terminology: Contamination, Frequency, Inert gas, Tungsten

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
7.1 Define terms		Foundation	Reading	Applies/Understands technical words that pertain to a subject [1.3.6]
7.2 Identify parts and equipment used in GTAW	7.2.1 Demonstrate ability to identify parts/equipment used in GTAW	Foundation	Reading	Applies information to job performance [1.3.4]  Identifies relevant details, facts, and specifications [1.3.16]
7.3 Explain the proper method for reshaping tungsten	7.3.1 Demonstrate the proper way to reshape tungsten	Foundation	Reading	Distinguishes between fact and opinion [1.3.11]  Interprets drawings to obtain factual information [1.3.17]
7.4 Identify different types of tungsten		Foundation	Reading  Speaking	Comprehends written specifications and applies them to a task [1.3.9]  Uses appropriate materials and techniques as specified [1.3.20]  Organizes ideas and communicates oral messages to listeners [1.5.7]
7.5 Explain proper set-up and usage of the GTAW machine	7.5.1 Demonstrate the ability to use the GTAW machine in a variety of situations	Foundation	Writing	Composes and creates document -- letters, manuals, reports, proposals, graphs, flow charts, etc. [1.6.8]

## Unit 8: Plasma Arc Cutting

### 5 Hours

Terminology: Electrode tip, Ionized gas, Plasma, Standoff distance

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
8.1 Define terms		Foundation	Reading	Applies/Understands technical words that pertain to a subject [1.3.6]
8.2 Identify parts and equipment used in Plasma Arc Cutting	8.2.1 Demonstrate ability to identify parts/equipment used in Plasma Arc Cutting	Foundation	Reading	Applies information to job performance [1.3.4]  Identifies relevant details, facts, and specifications [1.3.16]
8.3 Explain how plasma torch works		Foundation	Reading	Distinguishes between fact and opinion [1.3.11]  Interprets drawings to obtain factual information [1.3.17]
8.4 Discuss advantages and disadvantages of plasma arc cutting		Foundation	Reading  Speaking	Comprehends written specifications and applies them to a task [1.3.9]  Uses appropriate materials and techniques as specified [1.3.20]  Organizes ideas and communicates oral messages to listeners [1.5.7]
8.5 Explain proper set-up and usage of the plasma arc machine	8.5.1 Demonstrate the ability to use the plasma arc machine in a variety of situations	Foundation	Writing	Composes and creates document -- letters, manuals, reports, proposals, graphs, flow charts, etc. [1.6.8]

# Glossary

## Unit 1: Introduction to Agriculture Metals II

1. GMAW – Gas Metal Arc Welding; wire feed welding
2. GTAW – Gas Tungsten Arc Welding; “Tig” welding
3. Oxyacetylene – type of welding or cutting using a burnable gas of acetylene mixed with oxygen as an accelerant
4. Safety – free from accidents
5. SMAW – Shielded Metal Arc Welding; stick welding

## **Unit 2: Safety and Orientation Procedures**

1. Breathing hazards – potential threats (through inhalation) to personal safety
2. Electrical safety – safety precautions to prevent electrical shock, injury, or death
3. Gas hazards – potential threats to personal safety brought about by the production, use, or storage of gases
4. Personal safety – any effort made to decrease risk of injury (clothing, equipment, training, etc.)
5. Ventilation – exchange of air in the shop to expel fumes or smoke

## **Unit 3: Careers and Certification**

1. AWS – American Welding Society; agency responsible for welding certification
2. Helper – person who assists in welding or welding preparation
3. Welder – person who performs the welding task

## **Unit 4: Advanced Oxyacetylene Cutting**

1. Cutting attachment – device placed on the torch body that enables the oxy fuel cutting process
2. OFC – Oxy Fuel Cutting; process of cutting metals using oxygen and a burnable gas fuel
3. Operating pressure – pressure in PSI set at the regulator for the given operation
4. Regulator – device to set and control gas pressures
5. Slag – oxidized metal removed during the oxy fuel cutting process

## **Unit 5: Advanced SMAW**

1. Amperage adjustment – manipulation of machine output to increase or decrease heat
2. Filler pass – one or more weld beads used to fill the groove with weld metal
3. Heat adjustment – manipulation of the heat applied to base metal
4. Root pass – weld bead that extends into or includes part of the joint root

## **Unit 6: GMAW/MIG**

1. Bird nesting – condition where filler wire bunches or binds at drive rollers
2. Feed rollers – mated rollers in GMAW machine that drive and deliver filler wire
3. Flow rate – the rate at which a given volume of shielding gas is delivered to the welding zone
4. Metal transfer – movement of the molten filler metal material to the base metal
5. Wire feed speed –rate at which filler wire is delivered to the welding zone

## **Unit 7: GTAW/TIG**

1. Contamination – any foreign substance that may interfere with the GTAW process
2. Frequency – adjusted to HF start for DC welding; continuous for AC welding
3. Inert gas – a gas that does not combine chemically with materials
4. Tungsten – non-consumable electrode used for arc transfer in the GTAW welding process

## **Unit 8: Plasma Arc Cutting**

1. Electrode tip –replaceable, consumable end of plasma torch where arc and air are discharged to the metal to be cut
2. Ionized gas – a gas capable of conducting an electric current
3. Plasma – a gas that has been heated to an at-least partially ionized condition, enabling it to conduct an electric current
4. Standoff distance – measured distance between electrode tip and metal to be cut